



# Job Loss Analysis

**ID No:** 1322497 **Status:** Closed

**Original Date:** 05/May/2009  
**Last Review Date:** 16/Apr/2009

## Organization:

**SBU:** GLOBAL MANUFACTURING  
**BU:** ALL  
**Work Type:** Technical (Process Engineering)  
**Title (Work Activity):** Packed Column Inspection  
**Site/Region:**

| Personal Protective Equipment (PPE) | Selected | Comments    |
|-------------------------------------|----------|-------------|
| Safety Shoes                        | Y        |             |
| Hard Hat                            | Y        |             |
| Safety Glasses                      | Y        |             |
| Fire Resistant Clothing             | Y        |             |
| Hearing Protection                  | Y        |             |
| Lifeline/Body Harness               | Y        |             |
| Gloves                              | Y        |             |
| Knee Pads                           | Y        |             |
| Personal Gas Monitor                | Y        | H2S Monitor |
| Additional Task Specific PPE        |          |             |
| Other                               | Y        |             |
|                                     |          |             |

## Reviewers

| Reviewers Name              | Position | Date Approved |
|-----------------------------|----------|---------------|
| Johansen, Michelle L (MLMJ) | Manager  | 05/May/2009   |
| Ready, Ken S (KRDK)         | Manager  | 16/Apr/2009   |

## Development Team

| Development Team Member Name | Primary Contact | Position |
|------------------------------|-----------------|----------|
| Mansingh, James (JMZM)       | Y               | Engineer |
| Grubb, Rick K. (GRUB)        | N               | Lead     |
| Moore, Brad (BMJW)           | N               | Lead     |
| Mullek, Greg A. (GMUL)       | N               | Lead     |
| Porritt, Thomas M. (TPCS)    | N               | Lead     |

## Job Steps

| No | Job Steps                             | Potential Hazard  | Critical Actions   |
|----|---------------------------------------|---|--|
| 1  | Entering Column for Inspection.       | 1. Fatality or injury<br>2. Loss of time.   | 1. Reference JLA Control #1101716 (Confined Space Entry)<br>2. Reference JLA Control #1101716 (Confined Space Entry)   |
| 2  | Ensure proper PE Inspection Tool Kit. | 1. Loss of time if improper tools are not available while performing inspection in column.              | 1a. Applicable drawings/inspection sheets.<br>1b. Bubble level, ruler, flashlight (headlamp, bring a backup light), pen and paper (column inspection form, preferable), steel rod/hammer, inspection mirror, digital camera (permit may be required, not intrinsically safe check LEL level), low CI paint marker, laser level/water balance, tool bag, 4oz sample bottle with cap, knee and/or elbow pads.  |
| 3  | Safety in Column.                     | 1. Personnel injury from contact with column internals and/or loose debris.                             | 1a. Check tray stability before entering tray.<br>*Beware of corroded internals. Do not assume the tray can hold weight.<br>* Column internals are not designed to move, care should be exercised when moving around column internals.<br>1b. Look for sharp objects.<br>1c. When water testing, use caution, potential wet/slippery conditions.<br>1d. Use caution when climbing a Jacob's ladder. Side climbing is easier, while maintaining 3 points of contact.<br>1e. Scan column area before moving around. Look for probing TI's, slip hazards, low hanging beams, gaps in flooring, etc.   |
| 4  | Personnel Preparation.                | 1. Personal injury, not physically conditioned for task, fatigue, heat stress.                          | 1a. Do not perform inspection if one is experiencing muscular/skeletal strains or sprains that might impede climbing ability.<br>1b. Pace yourself, you do not have to complete the column by yourself. Utilize outside resources as appropriate to share the work load. Encourage/schedule breaks.<br>1c. Hydrate the body well before entering the column. Recommended hydrating 3 days before a known column inspection.  |
| 5  | Packed Column Inspection.             | 1. Economic loss (premature S/D, decrease performance, etc) if discovery item was not noted during S/D. | 1a. General Condition: Verify column clean and free of construction debris, hard hats, plywood, rust and other corrosion products. Dirt/debris can foul and plug liquid distributors and the like. Fasteners tight, internals in place? *Sizing to be consistent with design drawings.<br>1b. Bottoms Outlet: Right diameter? A vortex breaker is needed. Secure? Strainer required and provided? Level connections at the correct level? Pressure taps in the right place? You may have to check for pressure taps in each section of the column.<br>1c. Reboiler Feed: Reboiler feed nozzle the right size? Stable level provided for thermosiphon reboilers – by overflow weir(s) for example? If forced-circulation reboiler, are level connections in the right place?<br>1d. Bottom Vapor inlet, stripping steam inlet or reboiler return: All inlets above the high liquid level and arranged to give uniform vapor distribution? Inlets not too close to packing support? Mixed-phase returns arranged so that they impinge on the column wall (or suitable baffles) allowing liquid/vapor separation...extra column height may be needed.<br>1e. Packing Support (s): Depends on the type of support and packing: Gas Injection Support plate; No gaps through which random packing might escape? Vapor Distributing type (pan with chimneys); Chimney number, spacing, size and perforations are all correct? Liquid drainage holes (and tubes and seal pots, if supplied) are the correct number, spacing, and size? For structured packing and grid there is not much to check these packings rest on a grating. |

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| 6 | Packed Column Inspection (con't) | 1. Economic loss (premature S/D, decrease performance, etc) if discovery item was not noted during S/D. | <p>1f. Feed Inlet: Figure out how partially-vaporized /all liquid/all vapor feed is introduced and inspect based on that. Feed mixed with liquid and vapor in the feed zone? For vapor, includes providing column height (or center chimney which helps with vapor distribution) allowing vapor streams to mix. For liquid, includes thoroughly mixing the liquid descending the column with liquid feed before the mixture is distributed over the packing below. For partially vaporized feed, verify the vapor and liquid portions are separated then routed as described above. Inlet line pipe flanges tight? Pipe securely supported with provision for expansion (slotted bolt holes)? Pipes carrying a flashing feed need to be well supported.</p> <p>1g. Draw off Collector: Provision for collecting liquid, liquid at the wall, and directing into the collector? Collector been leak-tested? Seal welded if called for by the drawing? Does draw-off pipe drain the collector or draw-off sump? Vortex breaker in the draw off nozzle? Dimensions of the tray chimneys correct? Hats secure? Dimensions of the draw off sump correct? Level control taps in the correct position?</p> <p>1h. Water (or oil) Draw offs: Different designs available. Figure out how it works and inspect based on that.</p> <p>1i. Packing: Inspection of packing will be limited once the distributor and bed limiter are in place. Inspect packing while it is being loaded.</p> <p>1j Random Packing: Should be loaded via a sock or other means to minimize free-fall and mechanical damage. Workers leveling the packing should use supports to minimize crushing of the packing. Packing should be loaded up to the required height, and be level.</p>  |
| 7 | Packed Column Inspection (con't) | 1. Economic loss (premature S/D, decrease performance, etc) if discovery item was not noted during S/D. | <p>1k. Structured packing: Should be loaded to fill the column cross-section – filler pieces used for shimming gaps. Use vendor installation instructions to inspect rotation of alternate beds. Workers should minimize mechanical damage to the thin upturned metal edges. Packing loaded to the specified height? Top bed level?</p> <p>1l. Grid: Ensure the retaining/thru-bolts are installed as the bottom layer goes into place; otherwise it may be difficult to thread these all the way through the bed!</p> <p>1m. Thermowells in bed: Usually installed after packing is loaded. Ensure they are all in place.</p> <p>1n. Bed limiters: Bed limiter holds packing in place (except for grid, which is retained by thru-bolting). Inspect points depend on packing type: Random packing ... Bed limiter should be tight against the top of the packing? Holes in screen used to retain the packing pieces? Structured Packing... Bed limiter should be tight against the top of the packing (a screen is not required in this case)? Some vendors have a number of jack screws or similar means to press the limiter down against the packing. Is the bed limiter level?</p> <p>1o. Spray Distributors for Reflux and other Distributors/re-distributors: Distributor at correct elevation above the packing? All sections of the manifold securely supported? Number and type of spray heads correct? Tack welded in place? Heads on the correct pitch? Dual, in-line strainer on the feed or reflux nozzle? Mesh size of strainer correct (must be <math>\leq</math> 0.063 inches or <math>\leq</math> 1/3 internal free passage diameter of the nozzle, whichever is larger)? Have you flushed feed/reflux line away from column and manifold toward the column, before installing the spray heads? Has a water flow test of the distributor, in place been completed? (Note that you will need to correct for the liquid density when doing the test).</p> |

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| 8 | Packed Column Inspection (con't) | 1. Economic loss (premature S/D, decrease performance, etc) if discovery item was not noted during S/D. | <p>1p. Gravity Distributors for Reflux and other Distributors/re-distributors: The most important check is levelness per the vendor specification. (Cleanliness is next to levelness!) The usual specification is (+/-) 1/8" from a datum. Some vendors may require less leveling due to specific design of their distributor. Are perforations the correct diameter/on the correct pitch? If integral strainers are provided, are they in place and undamaged? Perforations open (this is where a dental mirror comes in handy)? Drip tubes at the wall are in place? All flanges tight? Flushed the feed or reflux line away from the column, before installing the distributors? Dual, in-line strainer on the feed or reflux nozzle? Mesh size of the strainer correct (must be <math>\leq 1/32</math>" if the distributor orifices are <math>1/4</math>" or smaller, <math>\leq 1/16</math>" for larger orifices)? Distributor at the correct elevation above the packed bed? Check that vapor chimneys have the specified dimensions and hats are provided as necessary to collect liquid raining down from above. If a pre-distributor is provided, is it in place and properly supported? All flanges tight? Perforations where they should be/right size? Trace the liquid flow through the distributor ... are all of the passages open, if impingement protection is needed – is it provided?</p> <p>1q. Vapor Outlet: Right diameter? Correct clearance from distributor? Weep hole required?</p> |
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